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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/552,731

11/15/2005

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039262-0142

9459

22428 7590 06/09/2009
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EXAMINER

WHITESSELL GORDON, STEVEN H

ART UNIT

PAPER NUMBER

2851

MAIL DATE

DELIVERY MODE

06/09/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/552,731	Applicant(s) OHMI ET AL.	
	Examiner Steven Hunt Whitesell-Gordon	Art Unit 2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 March 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,10,12,24,31 and 32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 24 is/are allowed.
- 6) ☒ Claim(s) 1-6,10,12,31 and 32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>1/21/09</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Acknowledgement is made of the amendment to the claims submitted 5 March 2009. Claims 7-9, 11, 13-23 and 25-29 are cancelled, claims 1-6, 10, 12 and 24 are currently amended and claims 30 and 31 are newly added. In view of the amendment, claims 1-6, 10, 12, 24, 30 and 31 are currently pending.

Claim Objections

2. Claim 10 is objected to because of the following informalities:

In line 11, "a plurality of said wavelength-conversion solid-state lasers" lacks antecedent basis and should be rewritten as -- a plurality of wavelength-conversion solid-state lasers --.

In line 16, it is unclear whether "a wavelength-conversion solid-state laser" is one of the plurality of said wavelength-conversion lasers. For the purposes of examining, "a wavelength-conversion solid-state laser" it is understood to be one of the plurality of said wavelength-conversion lasers.

Appropriate correction is required

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 12 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, it is unclear how "a copper vapor laser" recited in claim 12 can be the light source which is a "wavelength-conversion solid-state laser or a

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microwave-excited excimer laser" of claim 10. For the purposes of examining, the alternative solid-state laser is understood to be the light source of claim 12.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. **Claims 1-6 are rejected under 35 U.S.C. 102(b) as being anticipated by Mei [US 2002/0097495].**

For claim 1, Mei teaches a pattern writing system comprising:

a substrate 42, a pattern projecting apparatus using light control elements arranged two-dimensionally (DMD or SLM),

a micro lens array 154 to thereby project onto said substrate 42 a pattern in the form of an aggregate of a large number of spots (exposure grid on subject 42, see Figs. 8 and 12), and

means for relatively moving said substrate (scans with motor 52, which scans subject 42, see Fig. 2) with respect to said pattern projecting apparatus,

wherein pattern writing is performed that said substrate 42 is moved obliquely (by angle θ , see Figs. 8, 9 and 12) with respect to an array 154 of said large number of spots by said means for relatively moving said substrate, thereby forming the pattern projected (see Figs. 8, 11 and 12), and

wherein some of the spots included in said patterns caused by irradiation at different times overlap with each other at the same position on said substrate 42 (see Figs. 4, 10-11, and 14) so as to realize a level of gradation determined by overlapped times of the spots (each exposure is overlapped in either and on or off position, Fig. 4a shows that only after four pixels overlap each other will maximum exposure be reached, see [0037], additionally, periods of time inherently effects exposure dose, see [0031] and [0034]).

For claim 2, Mei teaches spots each have a polygonal shape (square shown in Fig. 4, 8 and 10).

For claim 3, Mei teaches an intensity of irradiation of each spot has an intermediate gradation by one-time irradiation and a required intensity is achieved when the spots are irradiated to overlap with each other a predetermined number of times on the same position on said substrate 42 (exposing an area by overlapping with multiple partial exposures until 100% exposure is accomplished, see [0037], [0038] Figs. 4 and 10 and 14).

For claim 4, Mei teaches a pattern writing method for projecting an aggregate pattern of spots arranged in a matrix (exposure grid on subject 42, see Figs. 8 and 12) onto a substrate 42 by relatively moving one of said aggregate pattern of the spots and said substrate 42 in a predetermined moving direction (stage scanned in direction 136 by scanning motor and pixel panel moved in one direction by panel motor and see [0050]), said pattern writing method comprising the steps of: rendering rows or columns of said aggregate pattern of the spots into an oblique state with respect to the

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predetermined moving direction; (exposed rows and columns at angle θ , see Figs. 8, 9 and 12) and performing pattern writing by moving said one of said aggregate pattern of the spots and said substrate 42 in said predetermined moving direction, with the oblique state kept intact (maintaining oblique state during scan, see Figs. 8 and 12) so as to realize a level of gradation determined by overlapped times of the spots (each exposure is overlapped in either and on or off position, Fig. 4a shows that only after four pixels overlap each other will maximum exposure be reached, see [0037], additionally, periods of time inherently effects exposure dose, see [0031] and [0034]).

For claim 5, Mei teaches the spots forming said aggregate pattern of the spots are projected to the same positions on said substrate a plurality of times during movement of said substrate in said predetermined moving direction (multiple exposures over a particular spot, see Figs. 4, 10 and 14).

For claim 6, Mei teaches the spots projected to the same positions on said substrate the plurality of times are provided by light control elements that are ON/OFF controlled (see [0037], [0067], [0073] and [0080]).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. Claims 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mei in view of Mei2 [US 6,379,867].

For claims 30 and 31, Mei teaches exposing an aggregate of spots (see Figs. 4a-b and 10.1-10.20).

Mei does not appear to explicitly disclose the spots each have an octagonal or hexagonal shape.

Mei2 teaches the spots each have an octagonal or hexagonal shape (see Fig. 8b).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the hexagonal shape spots as taught by Mei2 in place of the square shaped spots taught by Mei, because as taught by Mei2 in col. 9 lines 50-55, the hexagonal shape could allow for providing more complex two-dimensional shapes on to the surface of the substrate, such as diagonal lines, increasing the number shapes that can exposed on a substrate during a single exposure.

9. Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mead et al. [US 2002/0000426] in view of Mei and Ceglio et al. [US 5,691,541].

For claim 10, Mead teaches a pattern writing system comprising: a light source (1105 and 1107, see Fig. 11) having a plurality of said wavelength-conversion solid-state lasers (see Fig. 3 and [0028]), suitable for maskless, reticle free lithography, as evidenced by Ceglio in col. 3 lines 64-col. 4 line 4 and col. 5 lines 4-8, means for averaging output lights (1113, see [0039]) of at least two of said plurality of wavelength-conversion solid-state lasers and supplying the averaged light to a plurality of

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respective delivery systems (1109 and 1111, see Fig. 11), wherein a wavelength-conversion solid-state laser or a microwave-excited excimer laser is used as said light source (see Fig. 11), and wherein said means for averaging said output lights and supplying the average light to said delivery systems comprises a polarization beam splitter (see [0039]).

Mead does not teach that the pattern writing system is a EUV lithographic system; wherein the plurality of delivery systems and support for the work piece comprises: a mirror device including micromirrors arranged two-dimensionally, supplying exposure light to said mirror device, a substrate for mask pattern writing, a moving mechanism for moving said substrate in X- and Y-directions, means for directly projecting or reduction-projecting projection patterns output from said mirror device onto said substrate, and control means for overlapping said projection patterns a plurality of times over the substantially whole surface of a pattern projection area on said substrate to thereby perform exposure.

Mei teaches a mirror device including micro mirrors arranged two-dimensionally (DMD with 600x800 pixels, see [0031]), supplying exposure light to said mirror device (see Fig. 2), a substrate 42 for mask pattern writing, a moving mechanism 52 for moving said substrate in X- and Y-directions (see [0054]-[0060]), means for directly projecting or reduction-projecting projection patterns output from said mirror device onto said substrate (see Figs. 2 and 19-25), and control means 36 for overlapping said projection patterns a plurality of times over the substantially whole surface of a pattern projection

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area on said substrate to thereby perform exposure (with control system 36, see Fig. 2 and [0030], [0032], [0047] and [0077]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the patterning device, projection system, moving mechanism and control system as taught by Mei in the place of the each of the delivery systems, or respective workpiece and workpiece support of Mead, because this would allow exposing a digital pattern onto the surface of a substrate in multiple locations, increasing the amount of substrate real estate that can be exposed in a single scan, thereby increasing throughput.

For claim 12, Mead teaches a second harmonic of a solid-state laser (second harmonic of laser in Fig. 3 after doubler 311) or a copper vapor laser is used as said light source, and the system further comprising a wavelength conversion element (conversion elements doubler 311 and crystal 313, see Fig. 3) for converting a wavelength of said projection light.

Allowable Subject Matter

10. Claim 24 is allowed.

Mei teaches a pattern writing system with pulse light applied to a micro mirror device followed by a grating 152 (see Fig. 11 and 0063) to further shape the light. Toshiyuki [US 6,233,035] teaches a pinhole plate 15 that can divide, into a large number of fine light beams (see Fig. 5). Ohtsuka [US 6,049,555] teaches pinhole plate 18 has a Peltier element 22 (plate cooled holder 21, see Fig. 1). However, none of the above cited art alone or in combination teach the specifics recited in claim 24 of a

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pattern writing system including a pulse laser light generating portion and two-dimensionally arranged micromirrors and reduction-projecting said micromirrors onto a substrate, said pattern writing system comprising means for generating pulse laser light and means for performing pattern transfer while overlapping, in both of two perpendicular moving directions on said substrate, projection patterns of said two-dimensionally arranged micromirrors, each projected onto said substrate by one-time pulse laser light; a pinhole plate that can divide, into a large number of fine light beams, the pulse laser light from the pulse light source applied to a mirror device including said micromirrors, wherein said pinhole plate has a first Peltier element provided on one side of a first surface and a second Peltier element provided on another side of the first surface opposite the one side.

Response to Arguments

11. Applicant's arguments filed 5 March 2009 regarding claim 1-6, 10 and 12 have been fully considered but they are not persuasive.

12. In response to Applicant's first argument regarding claims 1-6, on page 7 lines 12--27, that because Mei realizes smooth patterning by partially shifting each pixel element partially overlapped, Mei does not teach superposing each pixel element a plurality of times so as to realize a level of gradations determined by overlapping times of the spots. Examiner respectfully disagrees.

In Figs. 4a, area 102 shows an area exposed to a predetermined exposure time (see [0031]) and overlapped four times in order to expose a substrate to maximum exposure. Area 104 is exposed to 75%; area 106 to 50%; and area 108 to 25%.

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Therefore, Mei teaches exposing the same position (102, 104, 106 and 108) on said substrate to realize a gradations (level of exposure or 102, 104, 106 and 108) determined by overlapped times (specific periods of exposure, see [0031]).

Accordingly, Applicant's first argument is not persuasive.

13. In response to Applicant's second argument regarding claims 10 and 12, on page 8 lines 5, that none of the cited art teaches the newly added limitations of claim 10, specifically, the "polarization beam splitter. Examiner respectfully disagrees.

Mead teaches a polarization beam splitter (1113, see Fig. 11). Accordingly, Applicant's second argument is not persuasive.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Hunt Whitesell-Gordon whose telephone number is (571)270-3942. The examiner can normally be reached on Monday to Thursday, 9:00 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on 571-272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. H. W./
Examiner, Art Unit 2851

/Diane I Lee/
Supervisory Patent Examiner, Art Unit 2851